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ABSTRACT

First grade students practiced reading ten unfamiliar function words; half studied the words embedded in printed sentences and half studied the words in unstructured lists and then listened to sentences comprised of the words. Posttest measures revealed that those who studied the sentences learned more about the syntactic/semantic identities of function words, whereas those who studied the lists remembered the orthographic identities of the words better and could pronounce the words faster and more accurately in isolation. The findings show that there are multiple aspects of printed words to be learned by beginning readers, and that the aspect that gets learned depends upon how the words are practiced. These results lend support to the theory of printed word learning in which various identities of words become amalgamated in lexical memory as a consequence of reading experiences with the words. (Author/RL)

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Paper presented at AERA, Boston, April 1980

Authors: Linnea C. Ehri and Lee S. Wilce

Title: Do Beginners Learn to Read Function Words Better in Sentences or in Lists?

(Extended version of this paper to appear in Reading Research Quarterly, 1980)

Abstract

First graders practiced reading 10 unfamiliar function words (i.e., might, which, enough). Half of the children studied the words embedded in printed sentences. Half studied the words in unstructured lists of words and then listened to sentences comprised of the words. Posttest measures revealed that sentence readers learned more about the syntactic/semantic identities of function words, whereas list readers remembered their orthographic identities better and could pronounce the words faster and more accurately in isolation. Findings show that there are multiple aspects of printed words to be learned by beginning readers. Which aspect gets learned depends upon how the words are practiced. Results are interpreted to support a theory of printed word learning in which various identities of words become amalgamated in lexical memory as a consequence of reading experiences with the words.

Text

Over the past few years, Lee Wilce and I have been performing studies to understand how children become proficient readers and spellers. Our work has centered on printed word learning rather than reading comprehension for two reasons. One, we have observed that word reading skill is a major determiner of effective reading comprehension in beginning readers. Two, we are optimistic about being able to develop an adequate explanation of printed word learning. In limiting our view to word learning processes, however, we have not thereby excluded meaning and comprehension from the picture. Rather, semantic experiences with print are viewed as providing an important source of information about printed words influencing how they are stored in memory. The experiment I will describe today deals with this very topic. A form of reading comprehension is treated as the independent variable, and its impact upon what is learned about printed words is examined.

To understand the design of the study and why we did it, you need to know something about our view of printed word learning, and also about a previous study.

First, it is important to recognize that there are multiple ways to read words. One can apply letter-sound decoding rules. This is a slow process but it may be necessary if the word is unfamiliar. One can guess a word based upon context cues or a combination of context and graphic cues.

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This may be faster but it leaves room for error. The third way is to match the form seen in print with a visual representation stored in memory. This process is the fastest and most reliable. However, in contrast to the others, it requires prior experience with words so that orthographic images can become established in memory. Our interest is in studying this third process and determining how beginning readers store printed words effectively in memory.

According to our view, printed word learning is not simply a matter of learning to pronounce written words. Rather there are several things to be learned about printed words. One, the spellings of words must be stored in memory as orthographic images. Two, letters in words must be recognized as symbols mapping phonetic elements in pronunciations. This is the way that orthographic images get into memory, by being amalgamated to the sound structure of words. Three, printed words must acquire the function of symbolizing meanings. We describe this as a process of amalgamating orthographic and semantic identities of words in memory. These three components of printed word learning do not necessarily develop together spontaneously. Rather what develops depends upon how the printed words are learned, that is, how beginners practice reading the words.

These points about printed word learning are reflected in the two studies I will describe. We will report the effects of two kinds of prior experiences on what children learn about printed words. We will measure three outcomes of word learning: (1) remembering spellings, (2) associating spellings with pronunciations, and (3) recognizing the meanings of the words.

In our first word learning study which has been reported in Child Development, we taught first graders to read 8 pairs of homonyms, that is, words with one pronunciation but two different spellings and meanings. Some of the children practiced reading the words in meaningful printed sentences. Others read the words on flash cards and then listened to the same sentences. We administered several tests following training to see what our readers had learned about the words. We found that learning varied. Children who had read the words in sentences were better able to recognize the meanings associated with particular spellings. However, children who had studied the words on flash cards could pronounce the words faster and remembered more letters in their spellings.

We interpret these results to support our claims that there are multiple aspects of printed words to be learned and that what is learned depends upon how the words are practiced. If meanings are active at the time the words are seen and read, then orthographic and semantic identities will become amalgamated in memory. However, reading words in sentences is less beneficial for learning the spellings and pronunciations of printed words. This is because sentence readers spend less time looking at letters and noticing how they symbolize sounds, and also because context cues may help them guess at unfamiliar words and thus eliminate the need for decoding. In contrast, readers studying words on flash cards are forced to attend to letters and determine how

they represent sounds. As a result, they learn more about the spellings and pronunciations of words. However, they learn less about meanings since meanings are not activated until afterwards when the sentence is heard.

The purpose of the present study was to determine whether these findings would generalize to another class of words. In studying children's lexical awareness, we found that function words were often not recognized as real words. These are words such as conjunction, prepositions, relative pronouns, auxiliary and past tense verbs whose meanings are syntactic and context-dependent. We observed that prereaders had trouble detecting the presence of these words in meaningful spoken sentences. Also, when the words were pronounced in isolation, prereaders treated them as nonsense sounds. In contrast, children who had learned to read the words did not display these difficulties. We reasoned that perhaps reading experience with function words teach children their syntactic and semantic identities, that is, provided the words are practiced in meaningful sentences rather than on flash cards.

An experiment similar to our previous one was designed to examine the effects of learning experiences upon the acquisition of printed function words. The independent variable was the way that children studied the words. In one condition, they practiced reading the words in printed sentences. In the other condition, they practiced reading meaningless lists of words and then heard sentences containing the words. The first group we will call sentence readers, the second group list readers.

Our subjects were spring term first graders who could not read over 6 of the 10 function words we had selected to teach them. The mean number recognized was 2.2 words. Subjects were matched on the basis of pretest scores. Pair members were assigned randomly to the two word training groups.

We selected 10 context-dependent words for training: these were: gave, might, very, while, which, must, both, from, should, enough. For each word, three meaningful sentences were written, 4-9 words in length. The other words in the sentences were drawn from a set of 47. To make it easier for children to read these other words, pictographs symbolizing their meanings were printed above the words. Each sentence or list of words was printed on a separate card. Sentences were printed in rows. Examples are given in Figure 1 on your handout. Lists displaying the same words but in scrambled order were printed in columns. In both conditions, pictographs appeared above the non-target words.

The experimenter worked with each child individually. First, children were given several pretests to measure their reading skills. Second, they were taught to identify the pictograph-word pairs. Third, they were given word training, reading either sentences or lists. Fourth, they were given several posttests to measure what had been learned about the printed words.

Training on the target words was structured so that the two treatment groups read all words the same number of times and responded to the meanings of the sentences in the same way. The main difference between the groups was that the context group read the target words in 30 sentences while the

isolation group read the words in 30 non-meaningful lists and then heard the sentences. Subjects read through each sentence or list twice in succession on each of four trials. If target or supplementary words were misread, the experimenter pronounced the word and then pointed out how letters correspond to sounds.

After subjects read or heard each sentence, we engaged them in a discussion of its meaning. This was to insure that semantic processing of the sentences was occurring during training. On Trial 1, a picture was presented for each sentence, and a question was asked requiring subjects to apply the meaning of the sentence to the picture. For example, the target word "should" was read or heard in the sentence, "The dog should not sit on the car." Then children saw a picture taken from a book about Clifford, the big red dog, in which Clifford is crouched next to a small car which has been completely flattened. The experimenter's question required the child to explain how the car got smashed. On subsequent trials, after reading or hearing each sentence, the child was asked to remember the picture he saw before and to answer the same question. If memory failed, he was shown the picture.

The posttests were designed to measure what subjects had learned about the words. To measure memory for letters, they were given spelling recognition and productions tests. To measure whether print had been amalgamated to pronunciations, they read a list of the target words and their responses were timed. To measure whether print had been amalgamated to meanings, three tasks were employed. (1) Children embedded the target words in meaningful sentences of their own creation. (2) They listened to 20 sentences on a tape recorder and attempted to identify which of four target words was present in each sentence. The third task was a sentence anagram task in which subjects unscrambled words to form a sentence. The dependent measures were the number of correct responses and in some tasks the number of seconds to respond.

The results are presented in Table 1 of your handout. First, we checked scores on 7 pretests to verify that sentence and list reading groups did not differ in any important way. Differences were statistically insignificant on all but one test. List readers were unexpectedly more accurate in naming alphabet letters than sentence readers. However, inspection of individual scores revealed that the mean difference was very small, less than one letter. Pairs did not differ significantly on the other measures considered more relevant for word learning. Nevertheless, to check for effects of this bias, we pulled out 10 pairs of subjects who did not differ in their knowledge of letter names, and findings for the whole group were verified on this subgroup.

Means of the two groups on the various posttests are listed in Table 1 of your handout. Matched-pair t-tests were used to detect differences. Results supported our expectations. List readers did better on the spelling tests than sentence readers. Also, they were able to read the words faster and more accurately. In addition, when they were shown the non-target words printed without their pictographs, they could identify more of them. However, sentence readers displayed superior knowledge of the meanings of the function words. They detected the presence of more function words in spoken sentences.

Furthermore, they embedded the function words in more semantically coherent and complete sentences whereas list readers gave more abbreviated or partial sentences or sentences with questionable meanings. We checked the actual sentences produced and found very few which were identical to the training sentences. This shows that sentence readers' superior performance did not arise simply because they remembered training sentences better.

Although two of the measures of semantic word knowledge distinguished the groups, the sentence anagram measure did not. Children were observed to proceed by trial and error in this task, suggesting that the task may not have been sensitive to their word knowledge.

These findings replicate those in our previous word learning study. They reveal that reading for meaning facilitates the process of attaching syntactic and semantic identities to printed words whereas reading words as isolated units promotes learning their spellings and their roles as symbols for sounds.

Analysis of performances during the training sessions revealed that list readers misread words significantly more often than sentence readers. These results are displayed in Figure 2 of your handout. This suggests one reason why list readers acquired more information about orthographic identities than sentence readers. Their incomplete knowledge of printed words was exposed so that the experimenter could intervene and help correct it. In contrast, the presence of meaningful contexts had the effect of propping up word identification among sentence readers and thus hiding their inadequate knowledge so that it remained uncorrected. This effect of sentence contexts is similar to the effect of pictures on printed word learning reported by Samuels (1967, 1970). Gagne has identified other instances of this phenomenon where performance is propped up but at the expense of learning.

In order to check for treatment-ability interactions, we divided our pairs of readers into two groups based on their word reading scores, and we examined whether the impact of training was the same for both groups. We found that it was not. The significant interactions are portrayed in Figure 3 of your handout. On some of the measures, the separation between sentence and list readers was greater among the less skilled word readers. There are two explanations for this. One is that since low ability readers were familiar with fewer target words than high readers, they had more to gain or lose in the treatment conditions. The second explanation is that low ability readers may be more susceptible to the advantages or limitations of particular learning conditions because they lack the skills or strategies which might enable them to compensate for deficiencies in instruction. Present findings cannot settle the matter since the design confounded the two factors, that is, pretraining familiarity with target words and basic reading skills.

Findings of the present study carry implications for reading instruction. Results suggest that in evaluating methods for learning printed words, there are costs as well as benefits to be considered. Benefits in learning meanings for

printed words may be obtained but at a cost of learning less about spellings and pronunciations. This suggests that the best approach is to provide multiple types of word reading experiences so that all aspects of printed words can become established in memory.

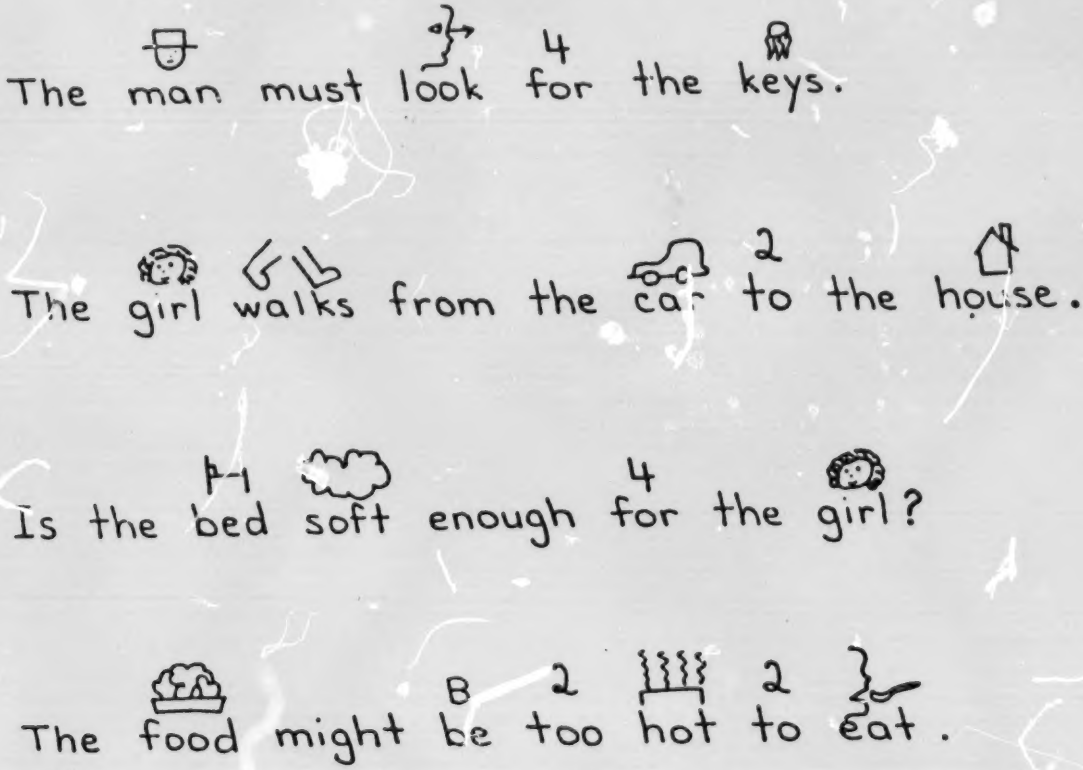
The man must look for the keys.
The girl walks from the car to the house.
Is the bed soft enough for the girl?
The food might be too hot to eat.

Figure 1. Examples of sentences read during training.

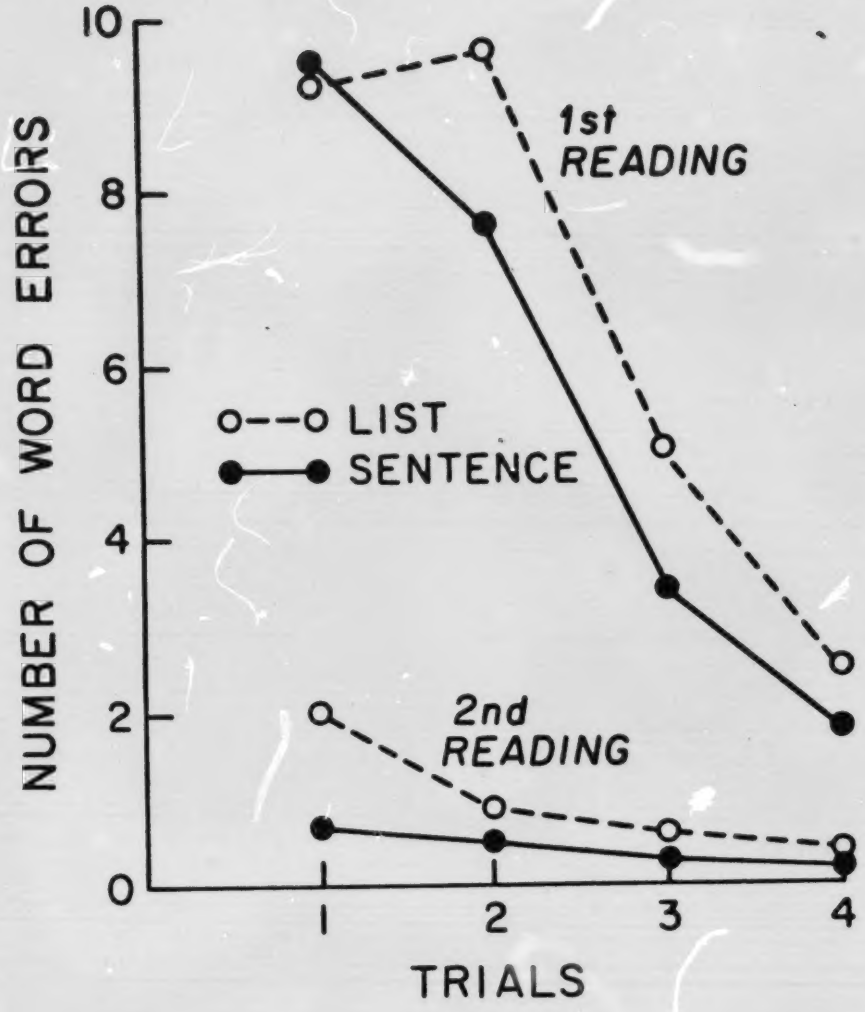

Figure 2. Mean number of target word identification errors made by sentence and list groups on the first and second reading over trials.

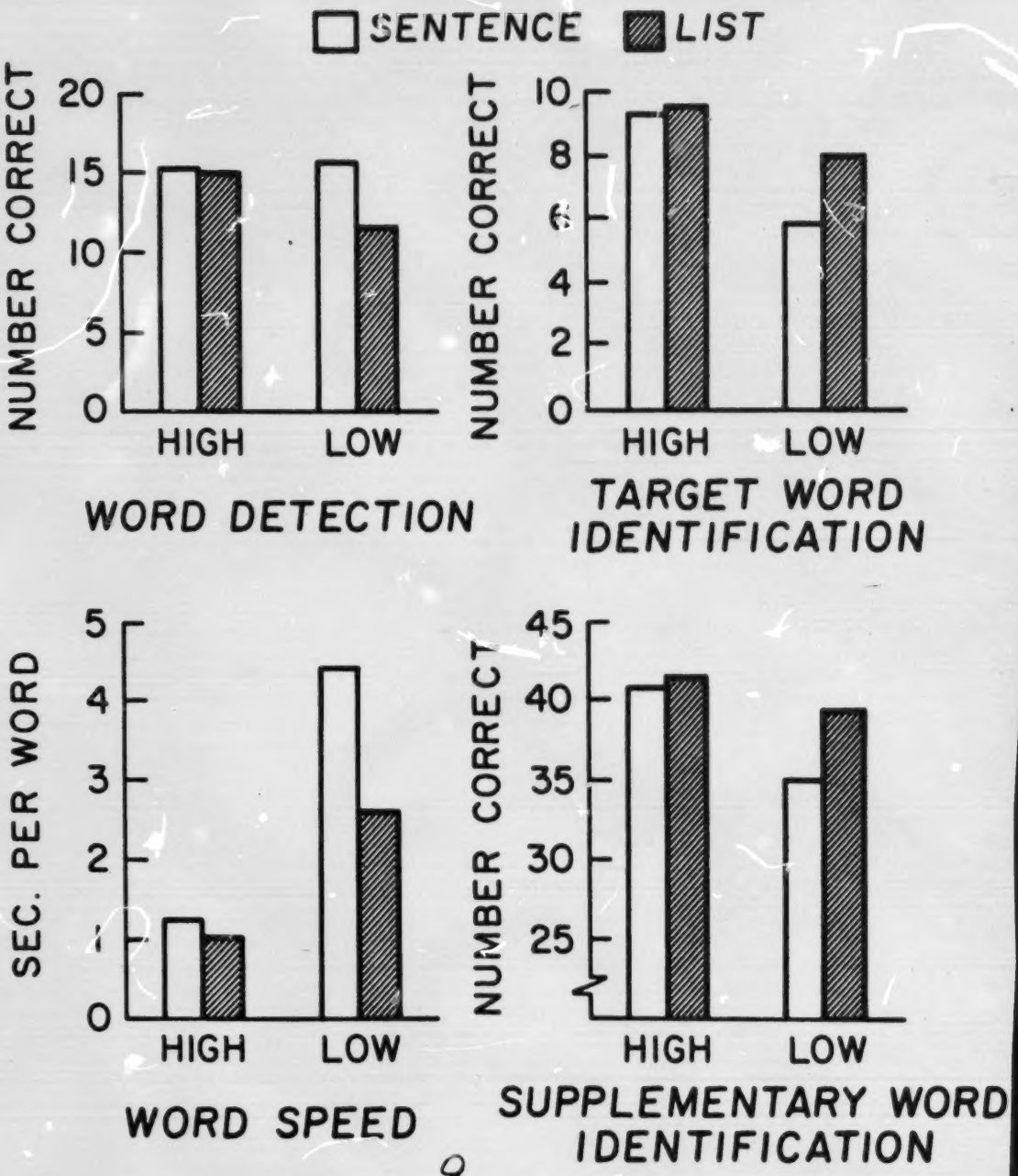

Figure 3. Interactions between reader proficiency level (high vs. low) and word training condition (sentence vs. list) on four measures of posttest performance.

Table 1

Mean Scores on the Pretests and Postests as a Function of Printed Word Learning Condition

Pretests	Context	Isolation	t-value[a]	Maximum Score	Standard Deviation
Word identification					
Target words	2.2	2.2	.00 n.s.	10	1.76
Others	43.1	43.4	- .42 n.s.	75	15.4
Letter name errors	1.15	0.50	2.94 **	25	0.96
Latency	23.35	23.40	- .05 n.s.	(sec.)	7.05
Familiar word spellings	55%	52%	.58 n.s.	100%	19%
Letters	85%	85%	.00 n.s.	100%	18%
Letter-sound knowledge	18.9	18.9	- .05 n.s.	25	4.19
Posttests					
Spelling - Words	2.25	3.15	-2.44 *	10	1.67
Letters	29.9	33.8	-3.01 **	47	6.05
Spelling recognition	7.1	8.5	-2.65 **	10	1.87
Word identification					
Target timed	7.2	8.2	-1.96 *	10	2.22
Target untimed	8.2	9.4	-3.09 **	10	1.72
Latency (sec./word)	2.83	1.80	-2.52 **	(sec.)	1.86
Supplementary	38.3	40.4	-3.05 **	43	4.63
Gain (pre to post)	+11.8	+13.6	-2.00 **	-	6.25
Sentences - Complete	7.6	5.2	3.47 **	10	2.75
Questionable	1.3	2.9	-3.04 **	10	1.76
Word detection	15.5	13.2	2.14 **	20	3.47

Table 1 cont'd.

Posttests	Context	Isolation	t-value[a]	Maximum Score	Standard Deviation
Anagram	7.0	7.1	-.10 n.s.	10	1.80
Mean latency[b]	2.66	2.84	-.82 n.s.	(sec.)	.61

[a]Asterisks denote significant differences on matched-pair t-tests: *$p < .05$, ** $p < .01$. A nonsignificant difference is n.s. Two-tailed tests were used for pretests, one-tailed for posttests.

[b]Mean number of seconds per word calculated only for sentences taking the child less than 30 sec. to construct. Only 13 pairs of subjects were given the anagram task.